Coins, moneys of account and price movements: the lower Rhine region in a European context

Metz, Rainer

Veröffentlichungsversion / Published Version
Zeitschriftenartikel / journal article

Historical Social Research, Vol. 16 — 1991 — No. 1, 60-82

CURRENT RESEARCH

Coins, Moneys of Account and Price Movements. The Lower Rhine Region in a European Context: 1350 - 1800

*Rainer Metz**

This article is a summary of the author's book: *Geld, Währung und Preisentwicklung. Der Niederrheinraum im europäischen Vergleich: 1350 - 1800. (= Schriften des Instituts für bankhistorische Forschung e.V. 14). Frankfurt 1990.* The tables, figures and maps mentioned in the summary refer to the book and are not included here. For a first information about their content see the listing in the appendix to this summary.

The focus of this study is the reconstruction and quantitative representation of the money of account systems of the Lower Rhine area and their change in value over the longest period of time possible. The special orientation towards the history of prices and wages requires the statistical reconstruction of gold and silver weight equivalents of the coins of account in consistent time series. The presentation of these fine weight equivalents is not only meant to provide the basic data for converting nominal price figures into grammes of precious metal, but it is also meant to create an empirical data base for the analysis of long-term trends in money of account values in the Lower Rhine area. Our comparison and analysis of the Lower Rhenish money of account systems within the framework of European money of account systems pursues three objectives:

1. To provide an exact description of changes in the value of moneys of account with regard to regional peculiarities and overall tendencies. This comparison is expected to highlight monetary interrelationships and the existence of currency regions in order to be able to appraise

* Address all communications to: Rainer Metz, Zentrum für Historische Sozialforschung, Bachemerstr. 40, D-5000 Köln 41.

and analyze the relative rank of the Lower Rhine region in the larger European context.

2. A comparison of the monetary structure based on money of account systems with the structure of nominal prices should enable one to check the representative value of the fine weight equivalents employed, and in addition provide criteria for assessing the dependence of nominal prices on fluctuations in the value of moneys of account.
3. Proceeding from theoretical considerations, a comparison of the monetary and price structures should help determine the degree to which movements in the value of moneys of account system can serve as indicators of general economic processes.

The coinage systems of the late Middle Ages and the early modern era can be described by the quality and face-value of the standard coins as well as by the structure of the accounting system. This means that the value of the coins of account can be empirically determined on the basis of official minting practices as well as by the exchange rates of certain key currencies. Thus, the conversion of price and wage figures into grammes of precious metal requires long-term and unbroken tabular figures which document the value of currency coins and its accounting units. Since the currency systems studied here always represent parallel standards (i.e. mixed currencies), such a study must be conducted separately for gold and silver, not least because gold coins dominated as functional key currencies until well into the 16th century.

The currency systems of the early modern era were divided up into four distinct spheres of circulation, to which various types of coin could be assigned according to their function in a particular sphere. The coins used in a given sphere varied greatly in quality and were subject to widely disparate inflation rates. Prices and the coins in circulation were linked by moneys of account, which due to their long-term fixed rates and largely abstract coins of account served as systems of accounting. All moneys of account have their origin in minted coins.

The fact that the money of account had a merely counting and measuring function (also applied to real money in circulation), while minted coins were the actual means of exchange and hoarding expressed the characteristic dichotomy of these currency systems.

The Problem of Devaluation of the Money of Account

It was precisely the analysis of prices and wages which gave rise to the question of how a depreciation in the value of the money of account can be calculated in such a way as to determine which particular price fluctuations resulted from this devaluation. This is especially necessary when ana-

lyzing supraregional prices in order to isolate regionaly differing devaluations of the money of account. This is also coupled with the assumption that prices devalued in terms of the fine weight equivalents of the money of account represent the »real« prices which are necessary for the analysis of economic developments. These problems have led to an intensive debate about the causes of this depreciation.

The specific ways of viewing this process of devaluation also determine which method is used for a practical calculation of the fine weight equivalent, for which there are various possibilities open. According to the »link-money« approach, in which coins of small denomination generally represent the link between the money of account and the coins in circulation, the cause of the depreciation in the value of the money of account is to be found in official minting practices. However, it has also been shown that the depreciation cannot be explained by official minting policies alone. In addition to official minting policies, increases in the exchange rate of silver and gold coins, which was independent of mint policies, also led to a devaluation. On the whole, the devaluation of the money of account can be traced to three causal complexes:

1. The value of the money of account was based on a minted coin which was a component of the money of account as well as the real money in circulation. In this way, the value of the accounting unit was set by the mint standard of the base coin (link-money).
2. The decline in the value of the money of account was expressed in the rise of exchange rates for heavy coins. Thus, the value of the money of account was no longer determined by the link-money, but by a conglomerate of domestic and foreign silver coins of small denominations and debased value.
3. Shifts in the silver/gold ratio led to a debasement of the fine weight of either silver or gold in different proportions.

These examples show that it is impossible either to calculate a clear-cut value for the coins of account or to give priority to any one of the methods of calculations under discussion. Due to this uncertainty, it is advisable to take all available data which can be organized into continual series and then calculate, represent and interpret the corresponding fine weight equivalents on a comparative basis. Finally, one of these values must be selected, or an average of all values calculated.

Historical Social Research, Vol. 16 — 1991 — No. 1, 60-82

Coinage, Currency Rates and Values of the Money of Account in the Cities of the Lower Rhine

Our interest here is concentrated on the moneys of account for the cities Cologne, Düren, Jülich, Aachen and Xanten, and on ways of representing changes in their value from the beginning of the 15th century to the end of the 18th century. These movements in value can be charted by examining official minting policies as well as the exchange rates of certain key coins. That the current level of research on the topic can be used only in part is shown by a critical evaluation of studies up to the present (Lamprecht, Kruse, Noss and Ebeling/Irsigler). For Cologne in particular, the level of research for the period from 1372 to 1511 is based primarily on the published texts of the Rhenish Minting Acts; the period from 1468 to 1511 is further documented by a valuation list for the Electorates of Cologne and Trier. The period covering the 16th to the 18th centuries has been documented by Ebeling and Irsigler, who have compiled and evaluated exchange rates used in the municipal accounting offices of Cologne as well as many other minting and valuation figures.

The resulting source typology suggests that one should clearly differentiate between the »official« and »actual« currency situation when assessing the overall data. While the »official« currency situation (i.e. the standard) can be derived from minting treaties, Imperial minting laws and mint instructions for masters of the mint, valuation tables are of decisive importance for the »actual« currency situation. In this study, extensive valuation tables for the cities of Cologne, Aachen, Düren, Koblenz, Jülich, Wesel and Xanten will be evaluated.

For representing the standard for the Cologne money of account, all available data pertaining to coinage standards and official exchange rates for silver and gold coins of the Rhine Electorate and, for the later period, of the city and Electorate of Cologne were arranged in tabular form from which the gold and silver equivalents of minted coins as well as the coins of account were calculated. In Table A2, the most important values for the period 1347 to 1750 are shown to be the rough and fine weight, fineness and the official exchange rates of gold and silver coins, as well as (but only until 1565) the resulting bimetallic ratio. In addition to minting account books of the mintmaster, municipal valuation tables and edicts were evaluated for representing the »inofficial« (actual) currency situation in Cologne for the period from 1399 - 1790. The resulting data permits a practically unbroken reconstruction of the exchange rate of the gulden from 1399 to 1696, of the albus in circulation from 1399 - 1620, of the Imperial and Crown taler from 1531 - 1764, and of the ducat from 1506 - 1784. These rates, in conjunction with the standard fine weights shown in Table A2, can be used to determine the value of the Cologne money of account

in grammes of both silver and gold, as well as the annual bimetallic ratio from 1399 to 1790 (Table A3).

In addition to the valuation tables for Cologne, the exchange rates for gold gulden and raderalbus were determined for Düren, Jülich, Koblenz and Wesel for the period 1453 to 1619 (Table A5 and A6).

The fine weight equivalents of the Aachen money of account can be reconstructed for the period 1372 to 1781. The calculation makes use of gold gulden exchange rates from 1334 - 1659 and those of the reichstaler from 1569 - 1720. The ratio of these rates to the corresponding rates in Cologne and to the fine weight equivalents established for Cologne were used to calculate the equivalent values of the Aachen money of account (Tables A7 and A8).

The data supplied by Beissel and Abel for Xanten prove to be questionable. Using selected exchange rates for the shild, gold gulden and taler, the value of the Xanten money of account was recalculated for the period 1350 to 1771/ 1810 (Table A9).

On the basis of the established exchange rates and fine weights of both minted coins and moneys of account listed in Tables A2 to A9, the development in the value of moneys of account for the Rhinish cities can be calculated.

Epochs of Rhenish Monetary History

The goal of this analysis is a quantitative listing of, on one hand, the development of the exchange rates of coins in circulation and on the other hand the progressive debasement of the money of account as evidenced by the minting of certain currency coins. The period from 1400 to the end of the 18th century is characterized by a permanent devaluation of the moneys of account.

1386-1454 Stable monetary value?: For the period 1386- 1454, it is doubtful whether the sharp upswing in exchange rates recorded in the account books of the mintmaster correspond to reality. According to the figures of the minting office, this epoch was subject to the same inflationary tendencies as the following period.

1454-1511 Disruption - Inflation - Reform: The series of exchange rates for the cities of the Lower Rhine show supraregionally a largely identical sharp devaluation of the money of account which cannot be explained on the basis of the official mint policy alone.

1511-1559 The Period of the Imperial Minting Ordinances: In terms of monetary history, this epoch represents a structural break brought about by the attempt to unify the coinage system at the imperial level, by the

increased production of European silver and by the influx of precious metals from abroad. A new type of standard coin appeared with the production and introduction of the taler. The exchange rates for this period also show an enormous devaluation of the money of account, despite the attempt made by the Reform of 1511 to stabilize existing rates.

1560-1651 Silver invasion: This period is marked by the enormous influx of silver from abroad and the accompanying devaluation of this precious metal in relationship to gold. Exchange rates for heavy coins display a similar movement as in the preceding epochs, yet with the exchange rates of gold coins rising more dramatically than those of silver coins. For illustrating the currency situation in Cologne, the year 1565 is a critical turning point. Official minting policy toward the production of silver coins was oriented to the value of the light silver money and stopped minting the heavier silver coins (Raderalbus). This put an end to the extreme discrepancy in value between light and heavy silver money in Cologne. The depreciation of silver can be seen in two phases, the first one lasting from 1590 - 1630, the second occurring after 1630.

1651-1780 Trends towards stabilization: For this period, the series of exchange rates, which had become increasingly scanty, indicate a stabilization in the value of the money of account.

Characteristics of Long-Term Trends

In order to obtain an unbroken series of exchange rates for gold coins from the end of the 14th to the end of the 18th centuries, the exchange rates for gold gulden and ducats were linked statistically. Accordingly, the rate of gold coins rose from 20.5 to 204 albus, or by a factor of 995% in the period from 1399 to 1784 (Fig. 41). A look at the figures recorded in the accounting books of the mintmaster reveals that this sharp rise in exchange rates was successfully checked in 1511 (although the basic data for the first phase - up to 1454 - should be regarded with scepticism). A long-term comparison of the exchange rates for gold gulden (Fig. 39) exhibits a largely parallel development for the cities of Cologne, Düren, Jülich, Koblenz and Wesel. Since the extent and course of the devaluation of the money of account as expressed in rising exchange rates are largely identical in all these cities, their cause cannot be attributed to any particular local or municipal factor alone.

The same method of statistical linking was also used to calculate a continual series of exchange rates for silver coins. From 1399 to the end of the 18th century, the exchange index for silver coins rose from 26.9 to 147, or by a factor of 572%, an increase considerably smaller than that obtained

for gold coins (995%). This difference is primarily the obvious result of fluctuations in the bimetallic ratio. According to valuation lists and the accounting books of the mintmaster, the raderalbus was also officially devalued on two occasions: namely, in 1454 and 1511. The currency reform of 1511 was carried out not only in Cologne, but also in Düren, Jülich and Koblenz. According to our calculations (Fig. 42 and 43), the exchange rates in the periods 1400- 1450, 1468 - 1510, and 1515 - 1560 suggest a much larger devaluation in the money of account than would have been caused by official minting practices. Hence, the value of the money of account as calculated from these exchange rates is generally considerably less than the official mint value until 1560. This discrepancy was not eliminated until 1565, when Cologne, Jülich-Berg and Kleve started issuing albus pieces, whose fineness was oriented towards the effective rates for gold gulden. From 1399 to 1784, the gold fine weight equivalent of the accounting gulden sank from 3.796 (= 100%) to 0.921 (= 7.7%) grammes, the silver fine weight equivalent of the accounting albus sank from 1.737 (= 100%) to 0.178 (= 10%) grammes, which corresponds to a annual rate of depreciation of -0.66% for gold and -0.59% for silver. Long-term trends in the value of the money of account display marked phases of devaluation of various magnitudes. In this sense, the periods 140Q-1452, 1452-1511 and 1511-1560 proved to be ones of extremely high inflation (Fig. 44), while the following decades were characterized by a rather moderate devaluation of the money of account. These data (Table 7) prove quite conclusively that the imperial minting laws ushered in a period of more moderate devaluation. Although the causes of this stabilization are not limited to these reforms, the introduction and implementation of silver coins of large denominations tied to national currencies did lead to a more stable monetary system on a long-term basis. The common view that imperial minting laws were primarily responsible for a strong destabilization of the monetary system has the *Kipper- und Wipperzeit* more in mind than this long-term tendencies. Surprising, the *Kipper- und Wipperzeit* hardly had any influence on the entire Lower Rhine region at all.

A comparison of devaluation movements in Aachen, Cologne and Xanten from 1372- 1765 shows that the rate of devaluation of the money of account in Aachen was one and one-half times larger than in Cologne and Xanten. By the beginning of the 17th century, the currencies of Cologne, Xanten and Aachen had become increasing stable. By far the highest rates of depreciation were booked in the 16th century. In addition, an apparently stable ratio can be deduced between the Xanten and Aachen currencies for the period starting around 1540, where one shilling in Xanten corresponded to one Aachen mark, or one mark in Xanten = 12 Aachen marks. Once the exchange rate between Aachen and Cologne had evened out at about 4:1 in the 17th century, a stabilization of the Cologne currency in

relation to the other two systems can also be noted. From the middle of the 17th century onwards, the three currencies had the following relative rates: 1 Xanten mark = 3 Cologne marks = 12 Aachen marks.

European Moneys of Account

In order to interpret and compare moneys of account of the Lower Rhine with other currencies, we conducted a critical evaluation of previous research and its treatment of moneys of account. Such an evaluation not only highlights the wide range of methodical approaches used for obtaining fine weight equivalents, but also reveals strong differences among many accounting systems with respect to the type and quality of sources. The purpose of this evaluation, therefore, was to examine and classify the available material in order to arrive at conclusive statements and comparisons.

First, the moneys of account calculated by Elsas for the cities Frankfurt, Speyer, Würzburg, Augsburg and Munich were reviewed, with many figures being recalculated. In general, it can be said that most of the tables worked out by Elsas are lacking in substantial information, misleading in their presentation and poorly documented. For example, only 13 values are given for the Frankfurt currency for a period covering almost 450 years. Although the 82 figures listed for the gold fine weight of the Munich pfennig represents a substantial documentation of this currency from 1400 to 1800, the corresponding figures for silver are entirely missing. On the other hand, Elsas provides only silver equivalents for the Augsburg currency from 1399 to 1830, so that a comparison of the Munich and Augsburg currencies based on these figures alone is impossible. Our reworking of the available data has resulted in fine weight equivalents which differ considerably from those obtained by Elsas, especially for the cities Frankfurt, Munich and Würzburg. Tables A10 to A12 show the silver fine weights of the Frankfurt heller and pfennig from 1349- 1764, the silver fine weights of the Speyer pfennig from 1362- 1764 and the silver fine weights of the Würzburg gulden/pfennig from 1377 - 1764. The silver fine weights of the Munich pfennig from 1400 - 1805, as well as the silver fine weight of the Augsburg pfennig from 1399- 1830, which we did not recalculate are shown in Fig. 62.

Our choice of other accounting systems was primarily guided by the study conducted by Braudel and Spooner, who presented and interpreted a large number of accounting systems as early as 1967. However, due to time limitations, we did not include their study of developments in Genoa, Naples, Spain, Russia and Tlirkey. In addition, our comparison included the accounting systems used in Lucerne, Antwerp, and of course in the Lower Rhine region.

England: The silver and gold fine weights of the English shilling calculated for the years 1340- 1780 are based on Feavearyear figures.

Flanders, Brabant, Netherlands: Based on figures by Sillem and Posthumus, the silver and gold fine weights of the Karolus gulden could be calculated for the period from 1380(1363) to 1838 (1874). Using figures from various studies (Sillem, Posthumus, Verlinden, van der Wee) as well as production statistics from the Antwerp mint, we calculated the silver and gold fine weight equivalents for the Flemish groat from 1346/49 to 1755/86 as well as the corresponding bimetallic ratio. On the whole, large differences in the respective values, such as those exhibited for Cologne, for example, were not to be found.

France: From Hauser's figures - inasmuch as only silver prices are specified - representative fine weights cannot be calculated with any certainty. For this reason, we used figures from de Wailly to calculate the silver and gold equivalents as well as the bimetallic ratio for the period from 1303 to 1793. Our evaluation underscored the uncertain nature of the data up to around 1450.

Crakow: The silver and gold value of the grosz, as well as the bimetallic ratio can be taken from studies conducted by Pelc and Tomaszewski for the period 1369- 1795. It was also necessary to reevaluate some of these figures more closely.

Danzig: The silver and gold fine weight equivalents for the grosz in Danzig can be reconstructed for the period up to 1500 with figures from the Elsas-Archive (Göttingen), and for the succeeding period by using price editions compiled by Pelc and Furtak.

Lucerne: Using Körner's figures, we were able to present the annual silver and gold fine weight figures in Lucerne from 1400/ 1417 - 1795. Up until the year 1480, the series demonstrate peculiarities which suggest that the silver fine weight figures are not entirely representative.

Austria: Using Geyer's exemplary representation of currency ratios in Austria as published in Pribram's price edition, we were able to establish the annual gold and silver fine weights of the accounting pound/gulden for the period 1354/ 1525 - 1891. Due to the lack of source materials, the bimetallic ratio for the years 1354- 1524 was assumed to be a constant 1:11.22.

Strassbourg: Hanauer lists only the silver fine weights for the Strassbourg accounting unit from the 12th century to 1726. A more or less cohesive series can not be ascertained until after 1340.

Historical Social Research, Vol. 16 — 1991 — No. 1, 60-82

The Relationship between Money and Prices

The relationship between money (coins) and prices was discussed under two aspects. The first one dealt with standardizing diverse price figures for purposes of comparison. The second aspect dealt with factors considered to be causal for prices, and thus also for changes in monetary value. These two aspects cannot be discussed independently of one another.

1. When standardizing prices, two objectives become apparent. The first aims at a consistent price denomination when analysing price structures and patterns. The second objective is primarily concerned with representing monetary value and the changes it is subject to. Although these two objectives are different in principle, their approach is identical: that of making prices comparable to one another (→ Problems of Price Reduction).
2. When examining the monetary causes of price fluctuations, one must consider changes in the value of coins in terms of precious metal, money supply, and the velocity of money circulation. Among the various models offered, the quantity theory of money assumes a decisive significance in this regard (→ The Quantity Theory of Money Approach).

Problems of Price Reduction

There are three different methods of converting local price figures into a unified accounting system:

1. Converting to - for the researcher - contemporary currency figures
2. Converting to a key currency coin which remains largely stable in terms of value
3. Converting to the coins' fine weight equivalents (silver or gold).

The first method can be discarded as scientifically untenable. The second method is in practicable, especially for an international comparison of prices, for on a long-term and international basis there were a number of key currencies which were not compatible to one another. This leaves the third method, which in turn gives rise to three questions:

1. What are the prerequisites for such a reduction?
2. Which precious metal - i.e. gold or silver - should be used as a basis for conversion?
3. What is the most appropriate method for calculating the correct, i.e. representative fine weight equivalent of the money of account?

As regards the first point, a reduction is only admissible when a functional link exits between price levels and the corresponding stock of precious metal. Implicitly, this means that the cash value of a coin must be based on its weight in precious metal. It is debatable whether prices react to fluctuations in precious metal content or in exchange rates. The opposite argument is put forth by Rogers. Research dealing with the history of prices reveals a great number of arguments both for and against such a reduction.

There is also a lack of consensus as to whether gold or silver should be used as the base of reduction. Theoretically, the gold equivalent should be favored, yet the basic figures available for silver are actually better suited for purposes of comparison. In this point too, research has not been able to agree upon a unified method. Since there seems to be no genuine criteria for prefering a particular method or one of the two precious metals, one should not commit oneself to any one particular form of presentation at the start, but first evaluate as many relevant figures concerning monetary history as possible.

Thus, the third question stated above concerning the method of calculating a representative fine weight equivalent is implicitly answered: there exists neither an ideal method nor an ideal source.

The problem of the price reduction can be summarized as follows: without a conversion of local price figures, prices cannot be compared on either a supraregional level or on a long-term basis. Especially when studying international prices, conversion of local prices is only possible by reducing them to precious metal equivalents. The admissibility of such a reduction hinges very decisively on the fact that the market value of a coin depends on its precious metal content, and that prices do indeed react to fluctuations in the cash value of coins and with them, to changes in the value of their precious metal content. Although it can be demonstrated that the rate of a coin depends on its precious metal content, the effect of coin debasement on prices has yet to be demonstrated conclusively.

The Quantity Theory of Money Approach

In Bodin's quantity theory of money, the value of money is primarily determined by the money stock. Its fundamental tenet states that an increase in the money stock causes prices to rise and that a decrease causes them to fall. In the empirical test of these connections, two factors play a key role: the stock (supply) of precious metal and the value of the money of account. The former being so because a decrease in the value of the money of account is also responsible for an increase in the (nominal) money supply.

Neither calculations based on production figures of the Antwerp mint nor those using figures supplied by Einaudi are able to confirm that a

definite (proportional) relationship exists between fluctuations in either the supply of money or the value of the money of account and prices themselves. Hence, changes in the price level - be they affected by the supply of precious metal or by fluctuations in the value of the money of account - remain in principle undefined. In light of this negative connection between a devaluation of the money of account and changes in price levels, the problem of evaluating the representative value of Cologne's money of account must be reexamined.

To answer this question, we compared price trends in Cologne with those of Antwerp, Maastricht and Strassbourg. Such a comparison puts Cologne in a somewhat special position in terms of price movements for the period after 1511, as opposed to the year 1454 and the years following. Although there is no watertight proof, it is likely that Cologne's special position resulted from the 1511 reform. Accordingly, it remains unclear which fine weight equivalent was representative for price trends in Cologne up to the year 1454. For this reason, figures for the period up to 1454 are based on official fine weight equivalents, while those for the following periods are based on those calculated from exchange rates taken from valuation lists.

Structure and Macroeconomic Relevance of Moneys of Account

Up to now, hypotheses concerning the connection between the value of the money of account, the supply of specie and price levels could not be confirmed empirically. To be sure, one generally assumed that each devaluation of the money of account led, at least in the long run, to a rise in prices. Yet neither this connection has been proven, nor are the conditions which lead to it well known.

Although there is widespread agreement concerning the possible causes of devaluation of the money of account, many questions still remain. For example, why do depreciation rates differ so dramatically in terms of both geographical location and historical period? How can stabilizing and destabilizing tendencies be best explained, and why do some of these phases last longer than others? Such questions concerning these phenomena inevitably lead to a macroeconomic approach, for by doing so it can be demonstrated that the overall economic consequences of a devaluation of the money of account have not been answered conclusively in the past. Although studies using the quantity theory of money approach have quite correctly highlighted the significant role played by the money stock, the only empirical variable at their disposal has generally been an estimated figure of the stock of precious metal. Since the decisive determinate used

by quantity theory to illustrate economic processes is the ratio of the money stock to the supply of goods, and not merely the ratio of the stock of precious metal to the supply of goods, an empirical investigation of this thesis must also address the constant rise in nominal value and the corresponding fall in the value of the money of account.

Empirically, however, it is impossible to isolate the various components of the money stock and their individual effects on price levels in the hope of arriving at a quantitative appraisal of their influence. Nevertheless, the causal significance of the supply of precious metal for price levels is considered to be empirically proven, while the effects and influence of coin debasement are regarded as relevant only in the long run. However, this does not permit one to specify under which conditions, to what degree and, above all, with which economic variables such a relationship may arise. Yet an exact knowledge of these connections is highly significant when investigating the representative fine weight equivalents with which nominal prices are converted into precious metal equivalents. In other words, we are looking for the value of the money of account with which the empirical price movements can be explained in a given economic framework.

A Macroeconomically-Oriented Model

There are but a few approaches which analyse the devaluation of the money of account according to a macroeconomically-oriented model. On one hand, an attempt has been made to specify those economic factors and processes which lead to a devaluation of the money of account; while on the other hand the economic repercussions of such a devaluation have been emphasized. The basic conviction here is that a devaluation of the money of account entails a long-term increase in price levels. The structure of nominal prices in Europe is thus not only an expression of regional differences in production and demand conditions, but is also a result of devaluations of the money of account to varying degrees. This in turn is interpreted as an indicator of precious metal prices.

The central component used to explain the devaluation of the money of account is the permanently increasing demand for money. In general, the level of money demand is regarded as being dependent on overall economic production. While the demand on money increases during times of economic expansion, it declines during phases of stagnation and recession. In this sense, a marked devaluation of the money of account is not only an expression of a strong currency demand, but is also an index of economic expansion.

Another indicator is the relationship between price increases and the devaluation of the money of account. According to this model, a sustained economic upswing is the result of a positive difference between the rise in prices and the devaluation of the money of account, i.e. when the devaluation of the money of account is less than the rise in nominal prices. Thus, developments of prices in terms of precious metal play a decisive role when evaluating phases of economic expansion and contraction. During phases of economic expansion, the rise in the price of goods is stronger than that of precious metals, resulting in a fall in the latter's purchasing power.

According to the classical theory of production cost, a decrease in the purchasing power of precious metal leads to a long-term decline in the production of precious metal. The lower the value of precious metal falls as a result of the general rise in prices, the less incentive there is for its production. Conversely, the same mechanism holds true when the purchasing power of precious metal increases, i.e. when the devaluation of the money of account is larger than the rise of nominal prices, thus causing a fall in prices as expressed in terms of precious metal. Such a constellation leads to an increase in the purchasing power of precious metal, which as such offers an incentive for its increased production. This explanatory approach implies that in times of economic expansion, coupled with a sharp money demand and a distinct rise in prices, a decrease in the production of precious metal can be expected. On the other hand, times of economic stagnation, coupled with a more moderate money demand, lead to a long-term increase in the production of precious metal.

One critical point that remains to be pointed out here is that the incentive for producing precious metal does not rest on money demand alone, but more on the profit margin dictated by the production costs themselves.

Based on these considerations, the interaction among the devaluation of the money of account, nominal prices of goods and precious metal prices assumes a central function in the interpretation of general economic tendencies. The relationships of these variables to one another can be worked out by using several typical constellations.

Structure of European Money of Account Systems

Our analysis aims at showing a comparative summary which ties together various moneys of account, general trends, long-term constants, regional differences and supraregional connections. First, we established a monetary structure based on money of account systems, and then compare this structure with one based on nominal prices. This was expected to provide

answers to the following questions: How does the structure of money of account systems and changes in the money of account influence nominal prices? Can the theoretical dependence of nominal prices on devaluation of the money of account be confirmed in general or only in part? Under which conditions do nominal prices reveal a corresponding dependence on moneys of account? Does the balance of all these facts enable one to make empirically sound conclusions about the macroeconomic relevance of moneys of account?

Currency Structures

A comparative study of the heller/pfennig systems showed largely identical silver values for the pfennig in Frankfurt, Speyer, Wiirzburg(252 den = fl), Munich, Augsburg and Vienna from the 15th century onwards (Fig. 89). This illustrates the structure of a large currency region whose form and intensity is to the best of our knowledge hitherto unknown. Of special interest is its increasing integration over the course of time.

In a comparison of the fine silver weights for Antwerp, Holland, England, Danzig, France, Cracow, Lucerne, Cologne and Xanten (Fig. 90), a number of significant parallels can be seen. Although the fine weight of the English shilling after 1560 is noticably higher than the other fine weight values and that of the Cracow grosz is significantly lower, a definite European »currency region« can be observed here whose fine weights had not only adjusted to one another in an absolute sense, but were also subjected to similar devaluations. Thus, the currency devaluations in Cologne, Lucerne, Danzig and Flanders seem to have occurred in a parallel fashion starting in the year 1550. A remarkable identity can also be established between the Lucerne double shilling and the French pfennig for the period from 1420 to 1620. Using these figures, the thesis can be put forth that those systems based on the shilling or groschen followed a different trend than the pfennig-based currencies. Many other questions can be added to this hypothesis: which moneys of account can be assigned to the various currency regions and for how long? Do some currencies dominate in a particular currency region? Are moneys of account based on the pfennig more stable than the shilling and grosz systems? In this sense, can the Lower Rhineland be seen as a unified currency region, and to which larger currency region can it be assigned?

We continued our analysis with a comparative illustration of relative devaluation rates as calculated by the percental lost. Accordingly, the cities of the Lower Rhine, France, Danzig and Cracow experienced on the whole a very high rate of devaluation (Tables 12 and 13). A comparison of percentile devaluation according to specific time intervals shows a constant decrease in long-term average inflation rates, which tended to even out at a

uniform level. Thus the average inflation rate for all systems in the period from 1350 to 1400 was -0.67%, yet only -0.3% by the 18th century. Here it is quite obvious that the process of stabilization made itself felt as early as the 16th century, while devaluation as a whole had remained quite strong during the 14th and 15th centuries.

Index figures covering the base period from 1450-74 were used to represent the various degree of devaluation as well as the relative rank of individual moneys of account within their overall framework. Each money of account was ranked by number in order to illustrate its relative strength. Ranks were organized into time series, thus showing the respective position of each currency over the course of time and its variations within the overall European economic structure (Table 14 and Fig. 91).

Enjoying a high rank are the moneys of account in Frankfurt, Speyer, Munich and Strassbourg. The most stable currency on a long-term basis was that of Frankfurt. The Strassbourg money of account, which held a high rank as early as 1470/89, proved to be a »climber« up until the beginning of the 18th century. Quite surprisingly, rankings for England did not demonstrate the continuously high position as was expected. England did not demonstrate the most stable currency position until after 1620.

In contrast to these relatively stable currencies, Aachen displayed the highest devaluation rates for all periods, with the exception of 1470 - 1489. Extremely unstable conditions were also shown for Cologne, especially after 1540, when the stabilizing effects of the reform of 1511 had gradually disappeared. With the currency reform of 1653/63, the value of the Polish grosz fell below the index values of the Aachen and Cologne currencies. A loss in value comparable to that experienced in Cologne can also be seen in the French money of account. To sum up: Aachen, Cologne, France, and later Poland had the most unstable moneys of account.

In addition to those currencies which maintained a steady rank over the course of time, there were also obvious »losers«, led by Milan, Venice and, with the most extreme downward trend, Xanten. In contrast, long-term upward trends can be seen for Antwerp, Augsburg, Lucerne and Vienna. Of these cities, Vienna proved to be the most successful in attaining monetary stability, with Lucerne showing the smallest degree of improvement. The moneys of account for Danzig, Cracow, Würzburg and England cannot be analyzed using this unified approach. Of special note is Danzig's realtively high rank in the 16th century, followed by its extremely weak position after 1630/49. Würzburg also demonstrates a frequent change of rank.

The geographical distribution of this process of devaluation can be seen in the accompanying maps. Map No. 1 for the period 1490 - 1504 shows a high devaluation in the moneys of account for Cologne, Aachen,

Flanders/Holland, France and Lucerne. An interesting development here is the relatively minor rate of depreciation in Xanten, since its geographical location would suggest an essentially higher devaluation. The high degree of stability shown by the Frankfurt and Würzburg moneys of account, as well as by the other pfennig currencies in Southern Germany reflects the major difference between these systems and those of the Lower Rhine. This suggests an apparent currency boundary between Frankfurt and Cologne which separated areas having completely different rates of inflation.

Map No. 2 for the period 1550- 1569 shows an extreme phase of devaluation in Aachen, with Cologne, France and the Netherlands displaying trends that are closely parallel. In addition, noticeable similarities can be seen between Xanten and the southern region of the Netherlands. A depreciation comparable to that of France and Cologne can be seen in Lucerne only. The identical values previously established between the Lucerne doppelschilling and the French denier obviously resulted in a parallel devaluation of the two currencies. In this regard, the relative stability of the Strassbourg pfennig seems notable. The value of the Strassbourg money of account seems to have been much more strongly linked to the Frankfurt and Wiirzburg currencies than it was to France.

Map No. 3 for the period 1650 - 1669 supports the view that the pfennig systems constituted their own currency region characterized by quite stable monetary conditions. Here Frankfurt and Strassbourg show the lowest rates of devaluation while Augsburg has the highest. At the same time, some currencies underwent a significant loss of value: most notably those of the Lower Rhine, France, Lucerne, Danzig and Cracow. On the other hand, the process of devaluation in the southern Netherlands/Holland did not maintain its initially high rate.

As can be seen from Map No. 4 for 1770- 1789, this conglomerate of currency regions remained in existance up until the end of the 18th century. The most extreme devaluations took place in Aachen and Cracow, followed by Cologne, Xanten, France and Danzig. The moneys of account in the pfennig currency region tended toward a certain monetary alignment.

Money of Account Devaluation and Price Movements

The main focus of our study has been that of formulating empirically-oriented statements concerning the dependence of nominal price movements on devaluations of moneys of account. Our analysis is based on a new empirical approach: in the same way that various currency systems can be classified by the relative depreciation in the money of account, they can now be also classified in terms of their relative increase in prices. As

was the case with ranking currencies in terms of relative stability of their moneys of account, a parallel ranking can also be made in terms of increases in nominal prices. Our hypothesis in this connection is thus:

> A dependency of price movements on changes in the value of the money of account can be demonstrated in cases where a particular currency's rank in terms of its money of account value corresponds to its rank in terms of nominal price increase.

With most currency systems, there is a high correlation between their rank in nominal price increase and their rank in the devaluation of the money of account. (Table 16 and Fig. 95) This result confirms the fact that developments in prices are dependent on devaluation of the money of account, which up to now has never been proved empirically. Thus, it is now clear that the commonly postulated linear relationship between money of account devaluation and price increase is not longer tenable. For it is not the absolute degree of increase in prices which is explained by the devaluation of a money of account, but rather the relative shift in prices as seen within the entire price structure.

In order to illustrate the interrelationships among precious metal prices, devaluation of the money of account and the rise in nominal prices, the series of prices used in the table was converted into equivalent grammes of silver. These equivalent silver prices were used to calculate the average price for a 20-year interval, which was ranked accordingly (Table 17). This provided us a triple rank system for each money of account (cf. Fig. 96):

1. its rank in terms of the devaluation of the money of account
2. its rank in terms of the increase in nominal prices, and
3. its rank in terms of the absolute grain prices as converted into silver equivalents

Rye prices in Flanders and France maintained a consistently high level. These systems demonstrated a high correlation in the significant devaluation of their moneys of account, the sharp rise in nominal prices, plus the increase in grain prices in terms of silver. This indicates economic expansion and at the same time contradicts the findings of Braudel and Spooner, who held that the devaluation of the money of account alone provided sufficient compensation for the rise in nominal prices. On the other hand, the connection among these variables in Cologne, Aachen and Xanten is not as clear-cut. While rye prices in Cologne were relatively high, their rank in Xanten was subject to significant fluctuations.

In contrast to these cities, rye prices in Frankfurt and Speyer turned out to be comparatively low. While this price range in Frankfurt coincided with a stable value for its money of account, the opposite was true in Speyer, at least starting with the year 1570. Augsburg's rank for rye prices generally ran parallel to that of its money of account. Here one can see a

correlation between the rapid rise in prices and the corresponding devaluation of the money of account. This constellation implies a loss of silver's purchasing power and is an indication of economic expansion. This result also contrasts to Braudel and Spooner's analysis, which held that Augsburg experienced a marginal devaluation of the money of account in the face of a sharp rise in nominal prices. In this sense, a very atypical example can be seen for Munich for the period up to 1590, where slight decreases in the value of the money of account were accompanied by very high rye prices, which would explain the relatively high value of the Munich pfennig.

England shows a completely atypical situation. Although the silver prices for grain here were nearly the highest to be found anywhere after 1590, the parallel loss of value in the money of account was practically zero. This therefore gives one the impression that not only were changes in nominal prices relatively independent of devaluation in the money of account until 1590, but also that the level of grain prices cannot be explained in terms of the other variables.

If the attempt is made to subsume the various individual examples into the initially formulated hypothesis, general statements can hardly be postulated. One result which should be retained is that the structure of the money of account has a considerable influence on the structure of nominal price fluctuations. The results also show that a sharp devaluation in the money of account alone is not enough to explain a high demand for money resulting from economic expansion. The results would tend to support the view that the absolute degree of nominal price rise is primarily influenced by economic rather than monetary factors.

Above and beyond these empirical findings, we would like to conclude with a few hypotheses of our own. If the annual growth rate is calculated by using the average decline of all moneys of account (= inflation) and these annual figures then averaged for ten-year periods, a trend of striking regularity emerges starting about the year 1480 (Fig. 100). Even a rough breakdown of dates exhibits unified phases - each with their respective rising and falling tendencies - for the periods 1480 - 1510/20, 1510/20 - 1560/70, 1560/70 - 1640/50, 1640/50 - 1720/30 and 1720/30 - 1780/90. Here increasing rates of inflation can be observed from 1560/70, most of them stretching over an interval of 50 years each. Intervals displaying a declining inflationary trend are generally shorter, lasting only about 20 to 30 years. We are apparently dealing with long-term fluctuations in the rate of inflation which demonstrate similarities to long-term economic cycles. The time frames of the individual phases of inflation run parallel to the course of price movements (trends and cycles).

In order to compare rates of inflation with price movements, we calculated growth rates from long-term price trends (Fig. 102). In general, one can say that the increase in trends peaked as early as 1550/60. It decreased

continually until 1620/40 until it finally reached negative growth, i.e. where trend values became absolutely smaller. Later on, an intermediate cycle« became apparent, where there was an increase in growth trends until 1690, followed by a decline until 1740. After 1740, there was a strong increase in the trend rate, which however peaked as early as 1780.

This course of growth rates is also interesting in terms of the price revolution in the 16th century. The series in Fig. 102 show quite clearly that the first definite trend phase occurred as early as the 15th century. The trend values began to increase around 1500/ 10 and reached their greatest extent by 1550/60. From this point on, the increase of trend increments - in an absolute sense - started to dwindle. And with the onset of the precious metal invasion from the Americas, the growth in trends soon began to decline again. Thus, price trends exhibited their strongest growth at a time when the huge supply of precious metals had not yet reached Europe.

Another interesting factor can be seen in the fact that from the middle of the 16th century the average rate of inflation showed an increasing tendency which did not begin its decline until as late as 1610/20 (cf. Fig. 102). The concrete significance of this for price developments in the 16th century was that the trend displayed a disproportionately large growth only during periods in which precious metals had not yet been able to expand the money stock to any noticable degree, and in which the average rate of inflation in the money of account tended to decline. In contrast, the price trend starting from the middle of the 16th century only grew at a disproportionately lower rate, that is, during a phase in which the money stock was expanded enormously. It should be noted here that at the same time the average rate of inflation again displayed a rising trend. We are of the opinion that these findings cannot be fully explained by the quantity theory of money alone. What is the explanation, for example, for the fact that a trend reverses itself exactly at a time when the supply of precious metal is noticeably expanded? That a systematic connection existed between the average rate of change in inflation, i.e. in the devaluation of the money of account, and price trends for the period after the 15th century remains beyond doubt. The question remains however: which is the cause and which is the effect? Since practically the same pattern of price trends is obtained when calculated in terms of precious metal prices, it is likely that the devaluation of the money of account is affected by a price trend influenced by other economic factors.

The theoretical explanation for this is that a disproportionately large increase in price trends results in a loss of purchasing power of precious metals. As a result of this drop in value, the production of precious metal tends to fall, along with its corresponding supply. On the other hand, the consequence of inflationary prices is an increased demand for money. During this phase, the money stock is therefore expanded by increasing the

face value of the coins in circulation, which is expressed empirically by a rise in the average inflation rate of the money of account. But as soon as the price trend is weakened - for whatever reasons there may be - there is not only a resumption of increased purchasing power but also of increased production, and thus supply, of precious metals. A decline in price increases as well the increased supply of precious metals both lead to a stabilization in a currency's value, which is expressed by a declining rate of inflation in the money of account.

It is obvious that prices and the economic factors which regulate them assume a chief role in explaining the value of the money of account. Unfortunately, the relationships brought forth in this study cannot be generalized in the desired manner. Our discussion has shown that a devaluation in the money of account was both an economic determinant and an essential factor in the economic development of Europe, and should not be regarded as merely an expression of monetary policies limited to a particular region.

Appendix

Figures, Tables and Maps of the book mentioned in the summary

Tables

7 Jahresdurchschnittliche Entwertungsraten des Rechengeldes in Köln.
12 Silberwertverlust der Rechengeldsysteme Europas: 1350 bis 1800.
13 Jahresdurchschnittliche Entwertungsraten (%) der Rechengeldsysteme Europas: 1350-1800.
14 Index und Rangplatz des Silberwerts der Rechengeldsysteme Europas: 1470-1789.
16 Index und Rangplatz der nominellen Getreidepreise in Europa: 1470-1789.
17 Getreidepreise in Gramm Silber pro 100 kg und Rangplatz.

A2 »Offizielle« Münzgewichte, Münzkurse und Rechen geldwerte rheinischer und kölnischer Währungsmünzen: 1347-1750

A3 »Inoffizielle« Kurse, Rechen geldwerte und Gold/Silberverhältnis in Köln: 1399-1790

A4 Dukatenkurse in Köln: 1506-1784

A5 Kurse des Goldgulden in Düren, Jülich, Koblenz, Wesel, Köln: 1453-1619

A6 Kurse des Raderaibus in Düren, Jülich, Koblenz und Köln: 1453-1620

A7 Kurse des Goldgulden und Reichstalers in Aachen: 1334-1720

A8 Silberfein gewicht der Rechenmark in Aachen und Köln, sowie die verschiedenen Wert Verhältnisse der Aachener und Kölner Mark: 1372-1781.

A9 Münzkurse und Feingewichte des Schilling in Xanten: 1350-1810

A10 Silberfeingewichte der Frankfurter Heller und Pfennige: 1349-1764

A11 Silberfeingewichte des Speyrer Pfennigs: 1362-1764

A12 Silberfeingewichte der Würzburger Rechnungswährung: 1377-1764

Figures

39 Kurs des Goldgulden in Köln, Düren, Jülich, Koblenz und Wesel 1380-1696.
41 Kursindex der Gold-und Silbermünzen in Köln 1399-1800.
42 Silberfein gewicht des Rechenalbus in Köln 1399-1781.
43 Goldfein gewicht des Rechenalbus in Köln 1386-1781.
44 Index des Gold- und Silberfeingewichts des Rechenalbus in Köln 1372-1790(1450-74= 100)
62 Silber fein gewicht des Pfennigs in Augsburg und München 1400-1800. Berechnungen)
89 Silber fein gewicht der Rechengeldsysteme in Aachen, Augsburg, Frankfurt, Köln, München, Speyer, Straßburg, Wien, Würzburg und Xanten (Heller/Pfennig) 14. Jhdt. - 18. Jhdt.
90 Silberfein gewicht der Rech engeld **Systeme** in Antwerpen/Holland, Danzig, England, Frankreich, Köln, Krakau, Luzern und Xanten (Heller/Pfennig/Groschen) 14. Jhdt. - 18. Jhdt.
91 Rangplatz des Index der Silber fein gewichte europäischer Rechengeldsysteme 1470-1789.
95 Rangplatz des Index der Silberfeingewichte europäischer Rechengeldsysteme und der nominellen Getreidepreise 1470-1789.
96 Rangplatz des Index der Silberfeingewichte europäischer Rechengeldsysteme, der nominellen und der in Gramm Silber umgerechneten Getreidepreise 1470-1789.
100 Veränderungsraten der Silberinflation deutscher Städte (10-jährige Durchschnitte) (1450-74= 100).
102 Wachstumsraten der Trends der Roggen- und Weizenpreise in Antwerpen (1400-1700), Brügge (1348-1800), Köln (1444-1796) und Wien (1371-1778).

Maps

1 Index des Silberwerts der Rechengeldsysteme Europas 1490-1509 (1450-74= 100).

2 Index des Silberwerts der Rechengeldsysteme Europas 1550-1569 (1450-74= 100).

3 Index des Silberwerts der Rechengeldsysteme Europas 1650-1669 (1450-74= 100).

4 Index des Silberwerts der Rechengeldsysteme Europas 1770-1789 (1450-74= 100).